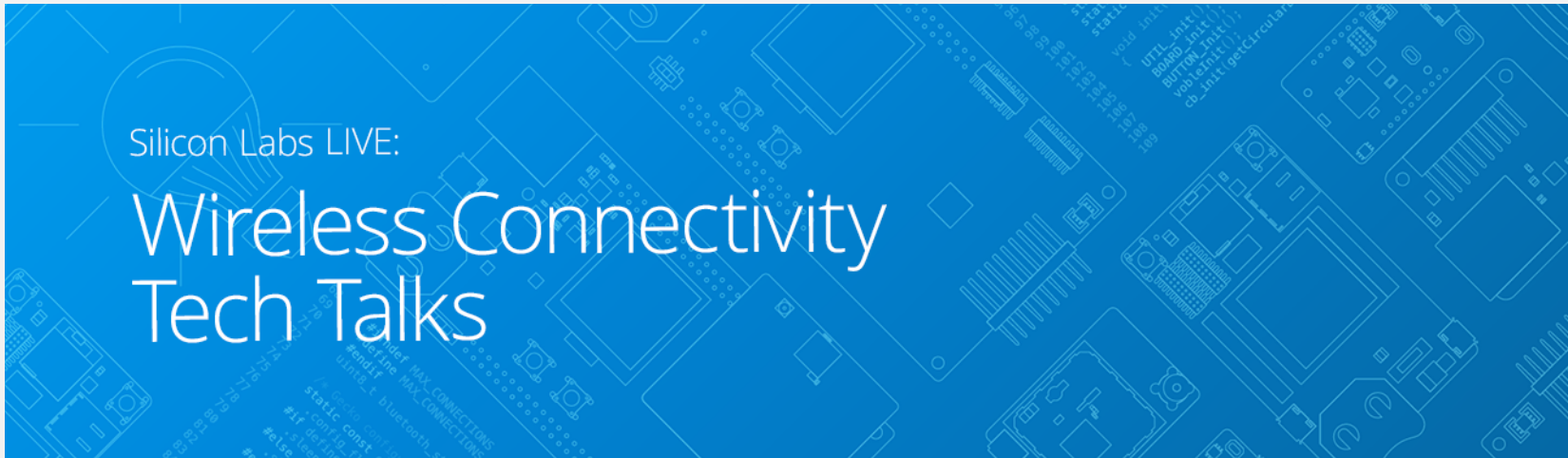


Tech Talks LIVE Schedule – Presentation will begin shortly



Topic	Date
Optimize a Battery Supply Using the Energy Friendly PMIC	Tuesday, June 2
Zigbee Software Structure: Learn about Plugins and Callbacks	Thursday, June 4
Multiprotocol Wireless: Real Application of Dynamic Multiprotocol	Tuesday, June 9
Wireless Coexistence	Thursday, June 11
Bluetooth Software Structure: Learn the APIs and State Machines	Tuesday, June 13
Add a Peripheral to a Project in No Time: Learn about the 32-bit Peripheral Github Library	Thursday, June 18

Please take the 3 question poll while waiting and be entered to receive a Mighty Gecko Starter Kit.



<https://www.silabs.com/support/training>

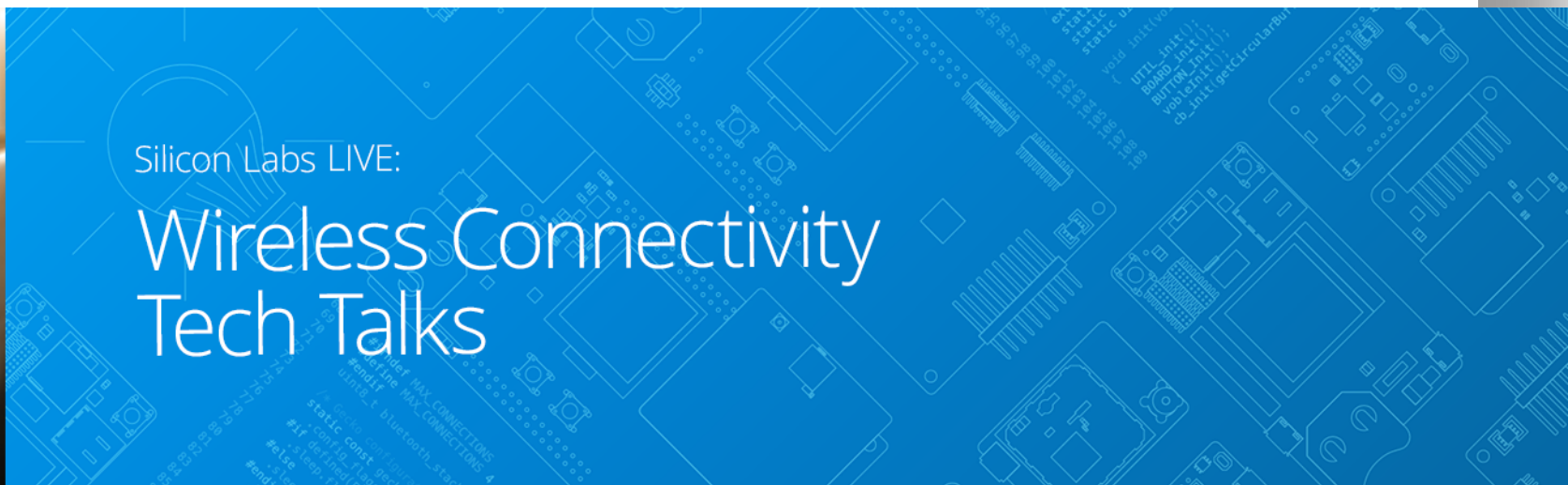


WELCOME



Silicon Labs LIVE:

Wireless Connectivity Tech Talks





Zigbee Software Structure: Learn about Plugins and Callbacks

JUNE 2020 | CHRIS LEAGUE

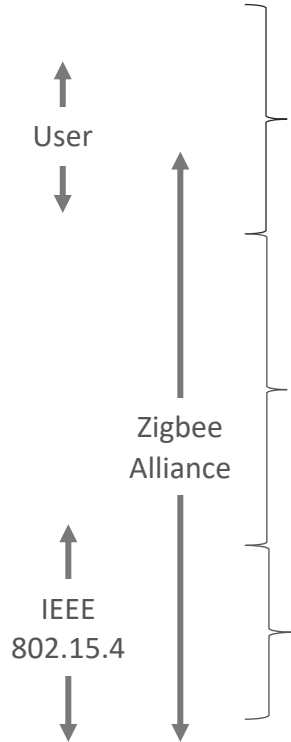
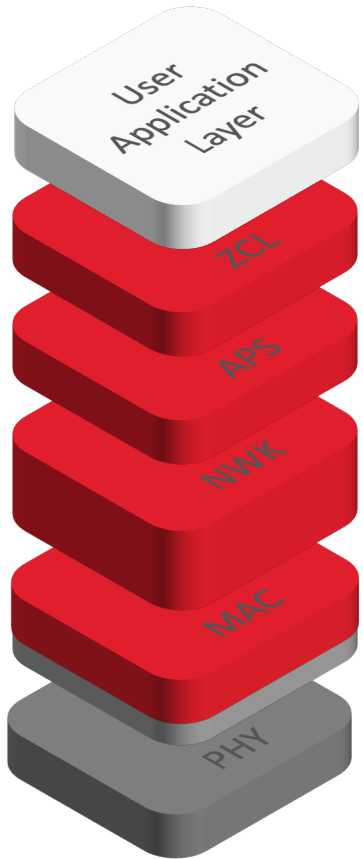


The Zigbee Alliance

- 400+ **global** member companies
- 2,500+ certified devices
- 300M+ products deployed
- Primary markets
 - Connected Home
 - Connected Lighting
 - Smart Energy
 - Commercial/Industrial



Zigbee 3.0
Zigbee PRO (R21)



User Application

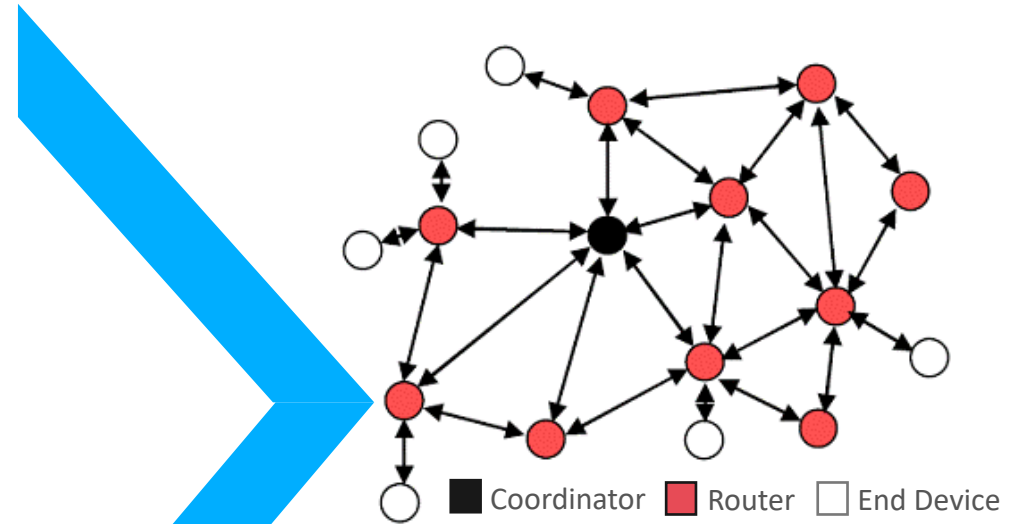
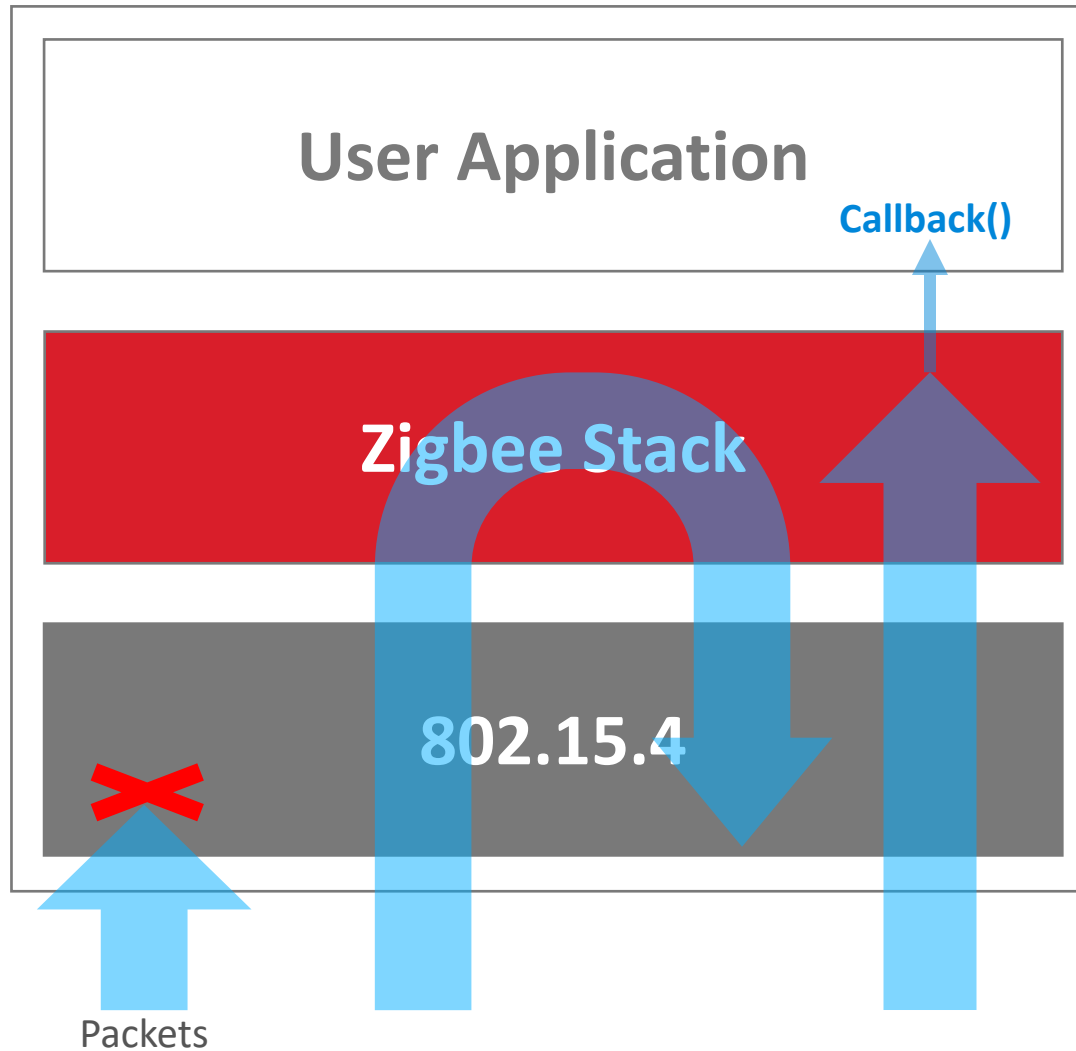
Zigbee Stack

802.15.4

Tasks Associated with Different Layer

Initiate and Join Network		Manage Network	
Determine Device Relationships		Send and Receive Messages	
Network Organization			ZigBee Pro Feature Set
Route Discovery	Message Relay		
Device Discovery	Security		
Medium Access			
Physical RF			

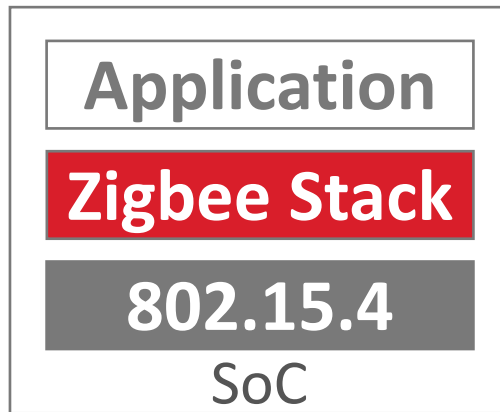
■ Hardware ■ Protocol Stack □ User Application



- Zigbee devices are a member of an *Intelligent Routing Mesh*
- *Protocol packets are not only used to send messages but also to manage the mesh network.*

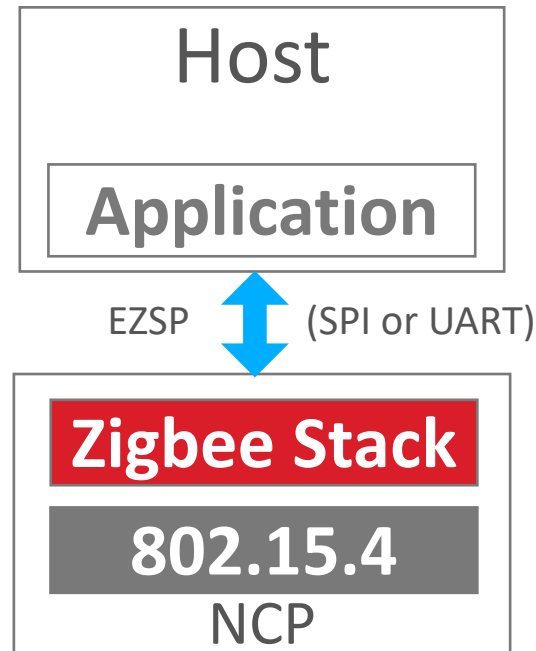
System-on-Chip

- One chip solution
 - Integrated MCU Core
 - Integrated Peripherals
- Minimal external components
- Lowest BOM cost
- Ease of Design



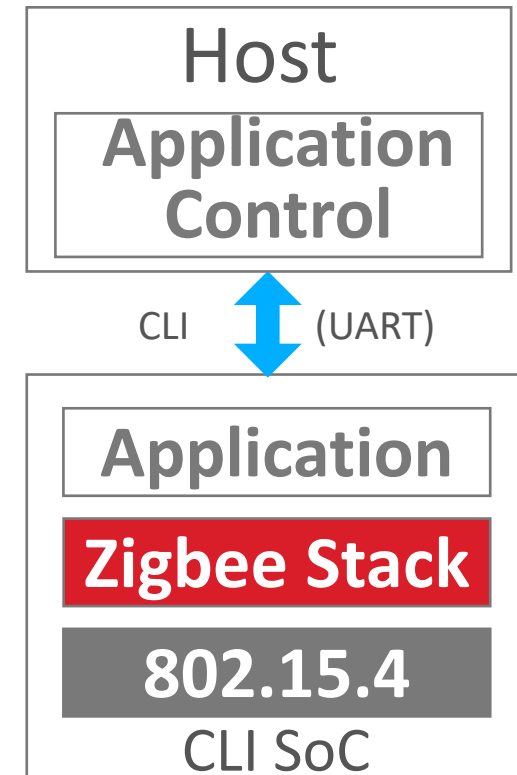
Network Co-Processor

- Self contained Zigbee stack
- Can be used with any host device
- Abstracts application from stack implementation
- EmberZNet Serial Protocol (EZSP)

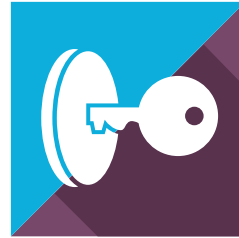
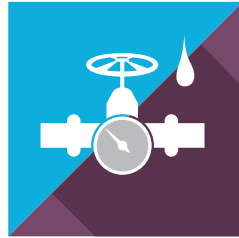
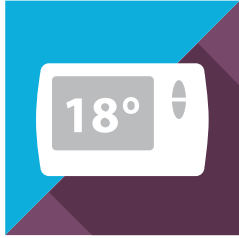


Command Line Interface SoC

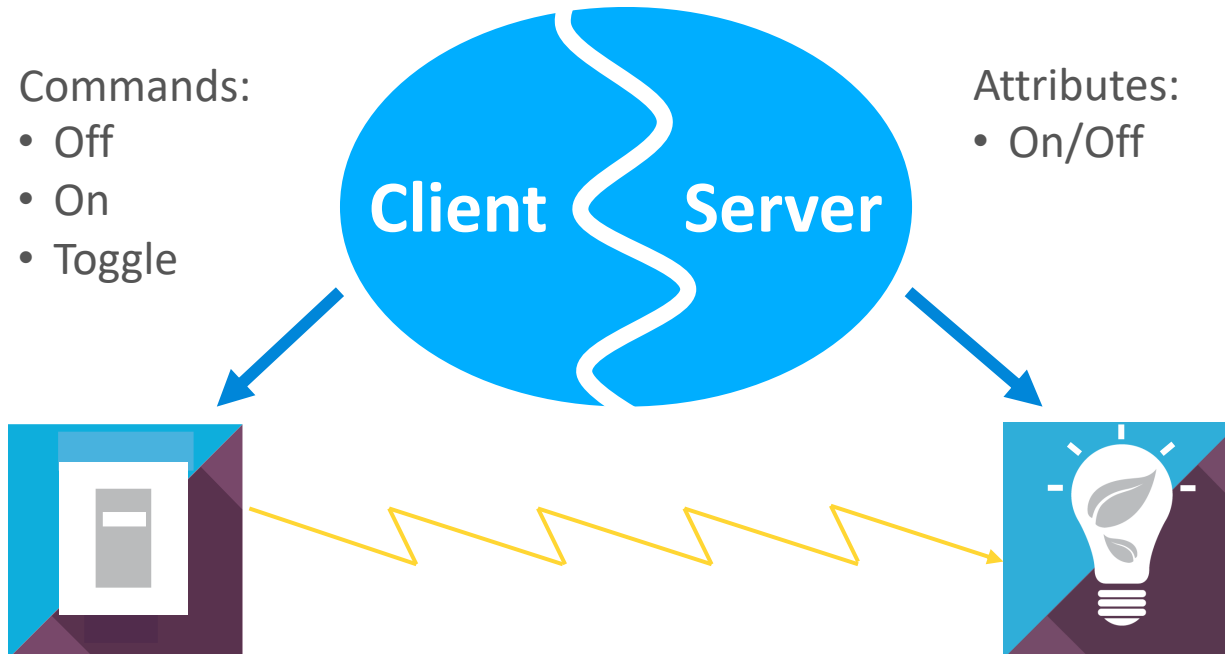
- An Open Source Solution

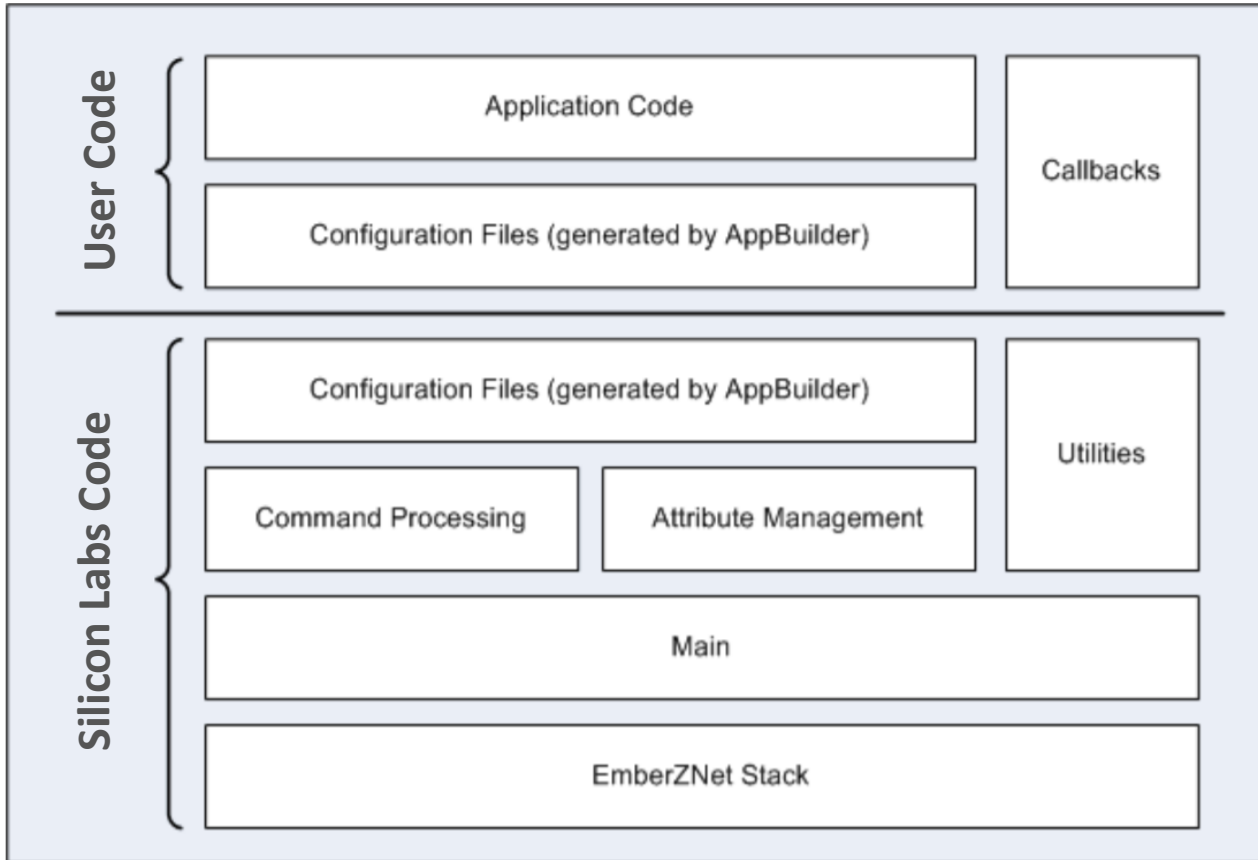


Zigbee Clusters describe “Things”

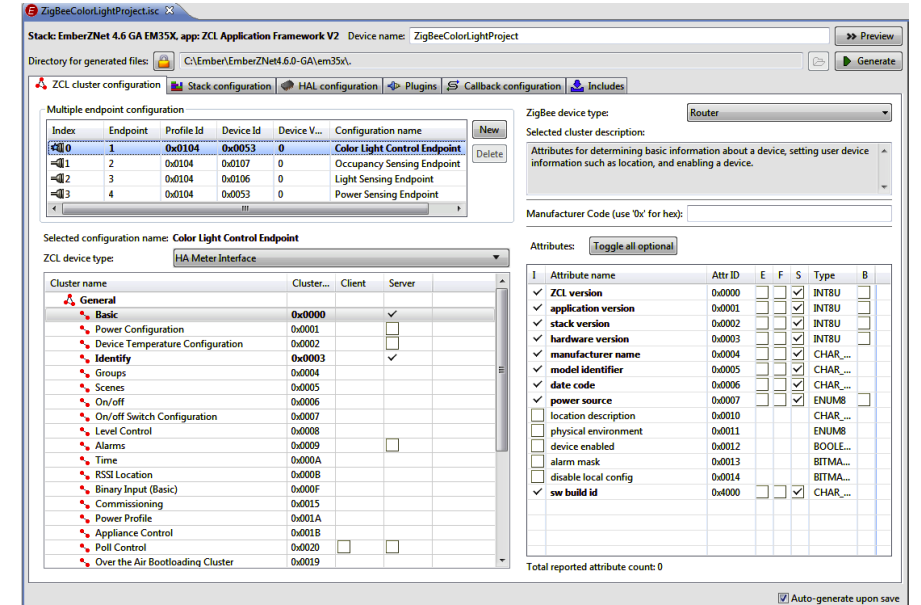


Zigbee On/Off Cluster





Application Framework Architecture



- Manage Profiles and Clusters
- Generate Configuration Files
- Put Plugins to work
- Implement Callbacks
- Create Events



Simplicity Studio 4

- **Simplicity Studio IDEs**
 - Free eclipse based IDE with code editing, compilation and debug for Windows, OSX and Linux
 - Pre-compiled demos, source code and documentation
- **Value-add tools include**
 - Graphical hardware configurator
 - AppBuilder
 - Energy Profiler – visual energy analysis
 - Network Analyzer – packet capture & decode
- **Example applications in source code**
 - Zigbee 3.0 Lights and Switches
 - Zigbee 3.0 Green Power Endpoint, Proxy, and Sink
 - Dynamic Multiprotocol – Zigbee + BLE
 - NCP and more
- **Compiler support**
 - GCC 7.2.1 or IAR 7.80.4

AppBuilder Walk-Through

Stack: EmberZNet 4.6 GA EM35X, app: ZCL Application Framework V2 Device name: ZigBeeColorLightProject

Directory for generated files: C:\Ember\EmberZNet4.6.0-GA\em35x\

ZigBee device type: Router

Selected cluster description: Attributes for determining basic information about a device, setting user device information such as location, and enabling a device.

Manufacturer Code (use '0x' for hex):

Attributes: Toggle all optional

Index	Endpoint	Profile Id	Device Id	Device V...	Configuration name
0	1	0x0104	0x0053	0	Color Light Control Endpoint
1	2	0x0104	0x0107	0	Occupancy Sensing Endpoint
2	3	0x0104	0x0106	0	Light Sensing Endpoint
3	4	0x0104	0x0053	0	Power Sensing Endpoint

Selected configuration name: Color Light Control Endpoint

ZCL device type: HA Meter Interface

Cluster name	Cluster...	Client	Server
General			
Basic	0x0000		<input checked="" type="checkbox"/>
Power Configuration	0x0001		<input type="checkbox"/>
Device Temperature Configuration	0x0002		<input type="checkbox"/>
Identify	0x0003		<input checked="" type="checkbox"/>
Groups	0x0004		<input type="checkbox"/>
Scenes	0x0005		<input type="checkbox"/>
On/off	0x0006		<input type="checkbox"/>
On/off Switch Configuration	0x0007		<input type="checkbox"/>
Level Control	0x0008		<input type="checkbox"/>
Alarms	0x0009		<input type="checkbox"/>
Time	0x000A		<input type="checkbox"/>
RSSI Location	0x000B		<input type="checkbox"/>
Binary Input (Basic)	0x000F		<input type="checkbox"/>
Commissioning	0x0015		<input type="checkbox"/>
Power Profile	0x001A		<input type="checkbox"/>
Appliance Control	0x001B		<input type="checkbox"/>
Poll Control	0x0020	<input type="checkbox"/>	<input type="checkbox"/>
Over the Air Bootloading Cluster	0x0019		<input type="checkbox"/>

I	Attribute name	Attr ID	E	F	S	Type	B
<input checked="" type="checkbox"/>	ZCL version	0x0000	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	INT8U	<input type="checkbox"/>
<input checked="" type="checkbox"/>	application version	0x0001	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	INT8U	<input type="checkbox"/>
<input checked="" type="checkbox"/>	stack version	0x0002	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	INT8U	<input type="checkbox"/>
<input checked="" type="checkbox"/>	hardware version	0x0003	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	INT8U	<input type="checkbox"/>
<input checked="" type="checkbox"/>	manufacturer name	0x0004	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CHAR_...	<input type="checkbox"/>
<input checked="" type="checkbox"/>	model identifier	0x0005	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CHAR_...	<input type="checkbox"/>
<input checked="" type="checkbox"/>	date code	0x0006	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CHAR_...	<input type="checkbox"/>
<input checked="" type="checkbox"/>	power source	0x0007	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	ENUM8	<input type="checkbox"/>
<input type="checkbox"/>	location description	0x0010	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CHAR_...	<input type="checkbox"/>
<input type="checkbox"/>	physical environment	0x0011	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ENUM8	<input type="checkbox"/>
<input type="checkbox"/>	device enabled	0x0012	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BOOLE...	<input type="checkbox"/>
<input type="checkbox"/>	alarm mask	0x0013	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BITMA...	<input type="checkbox"/>
<input type="checkbox"/>	disable local config	0x0014	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BITMA...	<input type="checkbox"/>
<input checked="" type="checkbox"/>	sw build id	0x4000	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CHAR_...	<input type="checkbox"/>

Total reported attribute count: 0

Auto-generate upon save

- Create a Zigbee Light Bulb using the On/off Cluster
- Put to work appropriate *Plugins* and *Callbacks*
- Use a Callback to turn the Light with an “On” is received.
- Create an *event* to delay to turning of the Light for after the “Off” command is received.

Generates certifiable applications and reduces time to market

BG22 Virtual Workshop



Learn how to develop and deploy more powerful, efficient, and secure IoT products with your own BG22 Thunderboard – free for all registrants!

North America:

June 23rd–25th, 2020

10:00AM –11:30 AM CST

(Other sessions available for Asia Pacific and Europe)

Register today! <https://www.silabs.com/about-us/events/virtual-bluetooth-workshop>

Documentation and Support

- **Simplicity Studio**
 - Release Notes
 - Datasheets
 - App Notes
 - Utilities Guides
 - Quick Start Guides
- **Silicon Labs' Online Community**
 - Knowledge Base Articles
 - Forum
- **Support Case**
 - Use for more complex questions
 - www.silabs.com/support
- **Getting Started with Zigbee concepts:**
 - <https://www.silabs.com/documents/public/user-guides/ug103-02-fundamentals-zigbee.pdf>
 - <https://www.silabs.com/documents/public/user-guides/ug391-zigbee-app-framework-dev-guide.pdf>
 - <https://www.silabs.com/documents/public/user-guides/UG105.pdf>
 - <https://docs.silabs.com/zigbee/latest/>

Glossary and Abbreviations...



ZigBee Terms and Abbreviations – IEEE 802.15.4

- FFD = Full-Function Device
 - Implements all MAC functions; able to serve as a coordinator
- RFD = Reduced Function Device
 - Implements subset of MAC functionality; no coordinator ability
- PAN = Personal Area Network
 - A single unique ZigBee / IEEE 802.15.4 network
- DSSS = Direct Sequenced Spread Spectrum
- CCA = Clear Channel Assessment

ZigBee Terms and Abbreviations – Stack Components

- APS = Application Support layer
 - Handles end-to-end (multi-hop) comms
- NWK = Network (Networking layer)
 - Handles routing, addressing, joining/forming
- MAC = Medium Access Control (layer)
 - Handles point-to-point comms
- PHY = Physical layer
 - Handles transmission of bits over airwaves
- SSP = Security Services Provider
 - Security engine interfacing with other layers
- ZDO = ZigBee Device Object
 - Software entity built into the stack for handling administrative queries/responses

ZigBee Terms and Abbreviations – Node Types

- ZC = ZigBee Coordinator
 - Principal controller of the PAN; 1 per network; an FFD
- ZR = ZigBee Router
 - Relays messages; doesn't duty cycle; an FFD
- ZED = ZigBee End Device
 - Doesn't relay messages; an RFD; depends on an FFD (parent) for routing inbound/outbound
- TC = Trust Center
 - Handles authentication for devices entering the network
- NM = Network Manager
 - Device responsible for handling frequency agility and PAN ID conflict resolution

ZigBee Terms and Abbreviations – Key Terms

- Association: process of gaining membership into PAN
- Authentication: process of gaining authorization to communicate securely among other devices in PAN
- Binding: creating logical/functional links between devices (at application level), such as switch to light or client to server
- Cluster: a message type in the application, usually pertaining to some command or attribute; signified by Cluster ID
- Commissioning: creating/modifying network-level device relationships (ZC/ZR/ZED) in PAN through *association*
- Endpoint: logical software component on a ZigBee device (like a “port” in Ethernet terms) for handling device functionality at application layer; not to be confused with “end device”
- PAN ID: PAN Identifier, used to delineate networks
 - EPID = Extended PAN ID; used for further disambiguation of PANs
- Provisioning – process of matching up devices in network to other devices with compatible services, usually via binding

ZigBee Terms and Abbreviations – Key Terms

- Association: process of gaining membership into PAN
- Authentication: process of gaining authorization to communicate securely among other devices in PAN
- Binding: creating logical/functional links between devices (at application level), such as switch to light or client to server
- Cluster: a message type in the application, usually pertaining to some command or attribute; signified by Cluster ID
- Commissioning: creating/modifying network-level device relationships (ZC/ZR/ZED) in PAN through *association*
- Endpoint: logical software component on a ZigBee device (like a “port” in Ethernet terms) for handling device functionality at application layer; not to be confused with “end device”
- PAN ID: PAN Identifier, used to delineate networks
 - EPID = Extended PAN ID; used for further disambiguation of PANs
- Provisioning – process of matching up devices in network to other devices with compatible services, usually via binding

Thank you

silabs.com

